CLAIMS

Sub A5

1. A method of estimating a communication path formed of a plurality of channels, the method necessitating an estimate of the impulse response C_1, C_2, ..., C_n of said channels, characterized in that it includes the following steps:

- acquiring a space statistic of the transmission path,
- establishing a corrected impulse response (C'_1, C'_2, ..., C'_n) at least by weighting said impulse response estimates (C_1, C_2, ..., C_n) by means of said space statistic and an estimate of the additive noise (N_{01}, N_{02}, ..., N_{0n}) of said channels.

2. A method according to claim 1, characterized in that said space statistic corresponds to an estimate of the correlation of said communication channels taken two by two.

3. A method according to claim 2, characterized in that said estimate of the correlation of the communication channels takes the form of a space correlation matrix (G) in which the element (g_{ij}) in the ith row and the jth column is obtained by smoothing the product ($C^h{}_iC_j$) of the Hermitian transposition of the estimated impulse response (C_i) of the ith channel and the estimated impulse response (C_j) of the jth channel.

4. A method according to claim 3, characterized in that if a signal S received by a channel corresponds to a transmitted training sequence the estimate of the additive noise (N_0) of that channel is obtained by normalizing the energy of the vector ($S - AC_1$) where A is the measurement matrix associated with said training sequence.

5. A method according to claim 4, characterized in that said normalization is followed by an averaging step.

6. A method according to any of claims 3 to 5, characterized in that if a noise matrix (N) is formed from the estimated additive noise (N_{01}, N_{02}, ..., N_{0n}) of the channels and a space-weighting matrix (G') is defined on the basis of said spatial correlation matrix (G) and said noise matrix $G' = G(G + N)^{-1}$, said corrected impulse responses (C'_1, C'_2, ..., C'_n) are obtained from the following expression:

$$\begin{pmatrix} C'^{t}_{1} \\ C'^{t}_{2} \\ . \\ . \\ . \\ C'^{t}_{n} \end{pmatrix} = G' \begin{pmatrix} C^{t}_{1} \\ C^{t}_{2} \\ . \\ . \\ . \\ C^{t}_{n} \end{pmatrix}$$

7. A method according to any of claims 1 to 6, characterized in that, if the signal (S) received by a channel corresponds to a transmitted training sequence, the method includes the following steps before establishing said corrected impulse response (C'_1) of that channel:
- acquiring a time statistic of the transmission channel,
- establishing the estimate (Xp) of the impulse response (C_1) of said channel, which estimate is weighted by said time statistic of the channel by means of said received signal (S).

8. A method according to claim 7, characterized in that said time statistic corresponds to an estimate of the covariance of said impulse response.

9. A method according to claim 8, characterized in that it includes the following steps:
- smoothing said impulse response and orthonormalizing by means of a transformation matrix W to obtain said

estimate of the covariance which then takes the form of a matrix L',

- seeking eigenvectors (v_i') and eigenvalues (λ_i') associated with that matrix L',
- estimating the instantaneous impulse response of the channel from said received signal (S) and applying that transformation matrix W to form a vector X', so establishing said weighted estimate (Xp):

$$X_p = \sum \left(\frac{\lambda_i' - N_0}{\lambda_i'} (v_i'^{h} . X') \right) W v_i'^{h}$$

where N_0 is a positive real number representing the additive noise of said channel.

10. A method according to claim 9, characterized in that said additive noise (N_0) is made equal to the smallest of said eigenvalues (λ_i').

11. A method according to claim 9 or claim 10, characterized in that each eigenvalue of a subset of said eigenvalues (λ_1') having a contribution less than a predetermined threshold is forced to the value of said additive noise (N_0).

12. A method according to claim 8, characterized in that said estimate of the covariance takes the form of a matrix R and said weighted estimate (Xp) is established as follows:

$$Xp = (A^t A + N_0 R^{-1})^{-1} A^t . S$$

where A is the measurement matrix associated with said training sequence and N_0 is a positive real number representing the additive noise of said channel.

13. A method according to claim 12, characterized in that it includes a step of orthonormalizing said matrix R by means of a transformation matrix W to obtain a new

matrix R′, the weighted estimate then taking the following new form:

$$Xp = W^t(I + N_0R'^{-1})^{-1}W^tA'^t.S$$

where the matrix A′ is equal to product of the transformation matrix W and said measurement matrix A.

14. A method according to claim 13, characterized in that the expression $(I+N_0R'^{-1})^{-1}$ is calculated by means of the matrix inversion lemma.